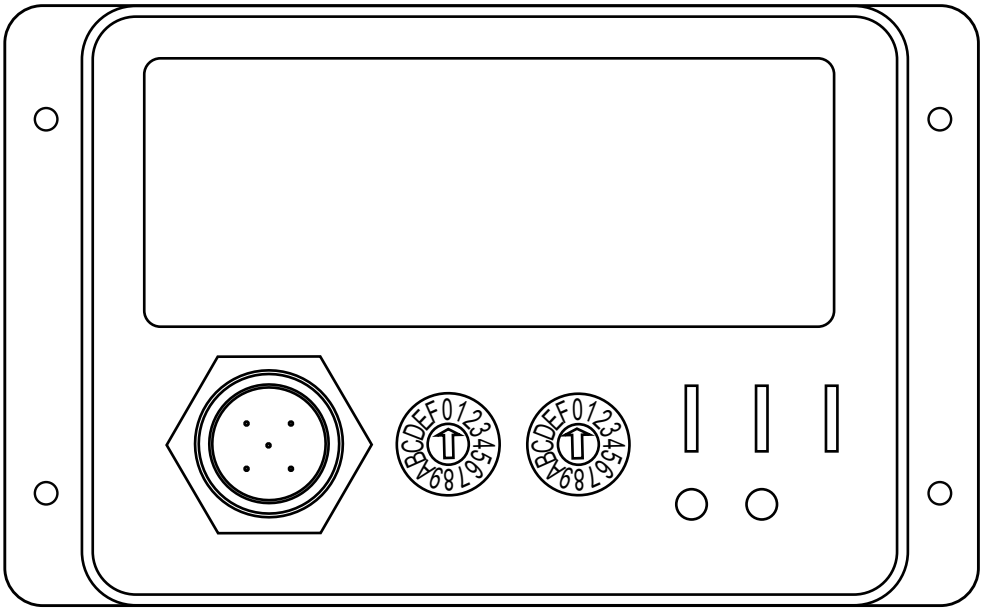
NMEA2000® 4-20mA Tank Level Adaptor
Part Numbers: 4291
USER MANUAL



Revision 2.00

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1 INTRODUCTION

The Offshore System's NMEA2000® part number 4291 4-20mA Tank Level Adaptor is designed to monitor any 4-20mA level sensor including Fuel, Fresh Water, Waste Water, Live Well, Oil & Black Water senders on the NMEA2000® network.

The Tank Sender Adaptor is water resistant but NOT waterproof. It is designed to be located in a dry and protected location. It is very important that it is installed and set up correctly according to this manual. Please read and follow the installation and setup instructions carefully to achieve the best results.

1.1 FIRMWARE REVISION

The information in this manual corresponds to firmware revision 2.00

1.2 PRODUCT FEATURES

The NMEA2000® 4291 4 – 20mA Tank Level Adaptor has the following features:

- **Convert 4 – 20mA tank level input to remaining level percentage with ± 1% full scale deflection**
- **Heartbeat blue LED confirming NMEA transmission.**
- **Faulty sensor/connection detection (under or over current)**
- **NMEA2000 micro C interface plug**
- **Panel mounting**

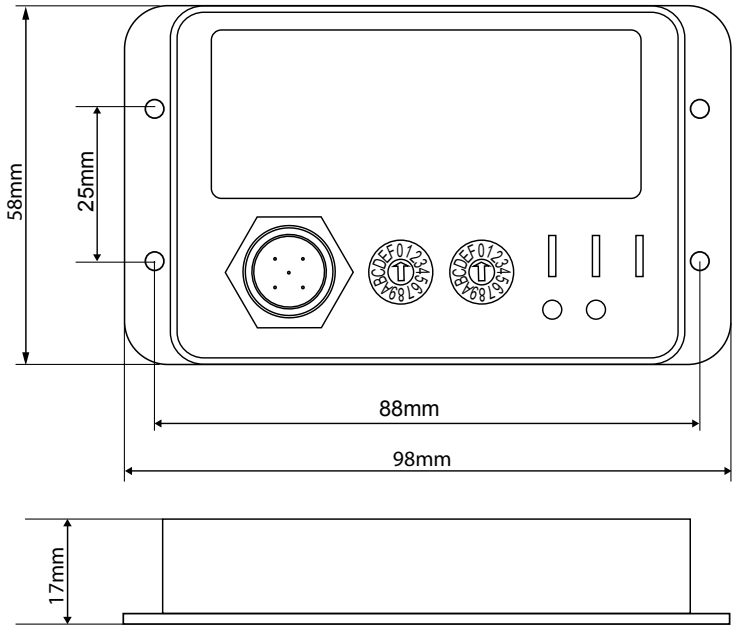
2 INSTALLATION

2.1 UNPACKING THE BOX

You should find the following items in the 4291 shipping box:
1 x 4291 NMEA2000® 4 - 20mA Tank Level Adaptor
1 x 4291 User Manual (This document)

2.2 MOUNTING THE UNIT

The unit should be mounted to a flat surface using 4 mounting screws. The unit dimensions and mounting hole's locations are shown on the following drawing:

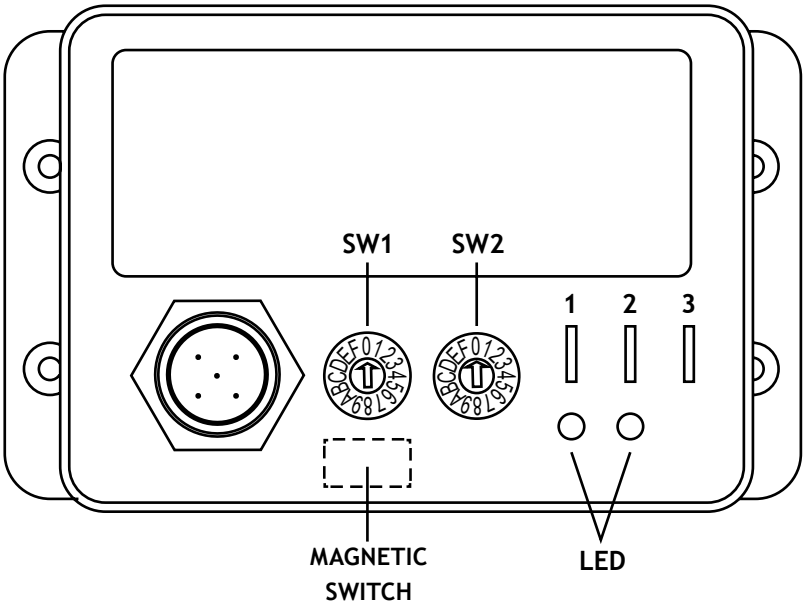


2.3 CONNECTING THE NMEA2000® CABLE

The unit is connected to the NMEA2000® network by the 5 way micro C plug on the front. Carefully attach the network drop cable to this plug and hand tighten until it is fully seated. Take care to match the orientation of the pip inside the socket to the recess inside the drop cable socket. The other end of the drop cable should be connected to a suitable Tee connector on the NMEA2000® network backbone cable.

2.4 CONNECTING THE 4 - 20mA SENSOR TO THE 4291 ADAPTOR

The connections for the sensors are as follows:



Connector	Function
1	GND (Cable Screen)
2	4 - 20 mA sensor input
3	24V Supply to sensor

2.5 CONFIGURATION

2.5 The following items can be configured on the 4291 Adaptor.

2.5.1 DEVICE INSTANCE

It is possible to choose from 6 tank types on the 4291 Adaptor. Selection of tank type is possible to set by turning the small rotary switch (SW1) with a small screw driver. Valid tank types are from “0” through to “5”. By selecting invalid tank type, the device stops to sending of NMEA tank level messages and the red LED shows the wrong selection.

.5.2 TANK TYPE

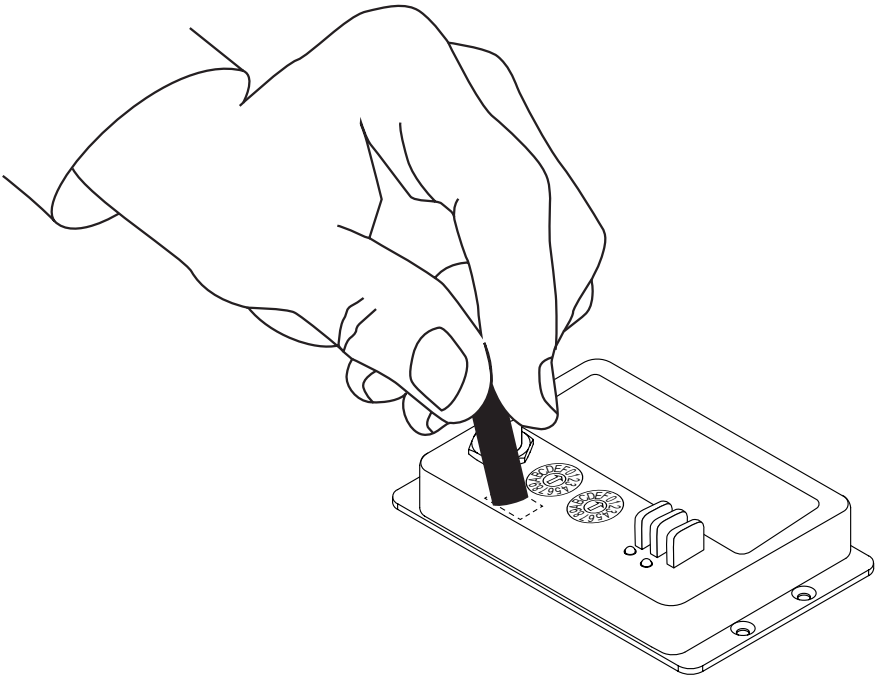
It is possible to install 16 units of 4291 Tank Level Adaptor for each tank type on the NMEA2000® network so they need to each have a unique Device Instance Address. The Device Instance of each unit is set by turning the small rotary switch (SW2) with a small screw driver. Valid Device Instances range from “0” through to “F”.

2.5.3 CALIBRATION VALUES

The 4-20mA Tank Level Adaptor can operate in either Level or Volume modes. Select your desired value with SW2 from the table below.

Level Mode – In this mode the adaptor sends pure (unmodified) level percent.
Volume Mode – In this mode, the level percent is modified by volume table of the device.

To select your desired operation mode, set SW1 to position and actuate reed switch, which is positioned under SW1 with a magnet.



The 4-20mA Tank Level Adaptor can be calibrated to operate between the set Empty & Full level. To set Calibration Values, when the tank is at the empty level, set SW1 to ‘E’ and acutate magnetic switch. When tank is at Full level, set SW2 to ‘F’ and actuate magnetic switch.

Empty Level - In this mode, during the actualization, the device stores the current tank level as the empty level**. Full Level** - In this mode, during the actualization, the device stores the current tank level as the full level.

Once the value selected correctly, setting Not Used values will not take effect on the device.

Switch Values			
Switch Position	**Device Instance SW2**	**Tank Type SW1**	**Calibration SW1 + button**
0	0	Fuel	Not Used
1	1	Fresh Water	Not Used
2	2	Waste Water	Not Used
3	3	Live Well	Not Used
4	4	Oil	Not Used
5	5	Black Water	Not Used
6	6	Invalid	Not Used
7	7	Invalid	Not Used
8	8	Invalid	Not Used
9	9	Invalid	Not Used
A	10	Invalid	Not Used
B	11	Invalid	Not Used
C	12	Invalid	Level Mode
D	13	Invalid	Volume Mode
E	14	Invalid	Empty Level
F	15	Invalid	Full Level

3 CALCULATING THE TANK LEVEL

The Tank Level value calculated as percentage of the fluid level, between the empty and full level values. In Volume Mode this value modified by the Volume Table of the device, which is represents the shape of the tank. The 4291 can be factory programmed with up to 100 points of volumetric information and to transmit the remaining fuel VOLUME percentage if the user chooses

PERCENTAGE LEVEL MODE output from 0 – 100% indicates the percentage level of the fluid in the tank. The user can tell when the unit is in 'Level Mode' because the blue LED flashes ONCE every 2.5 seconds when a level message has been sent.

PERCENTAGE VOLUME MODE output from 0-100% indicates the actual fluid volume within the tank taking
allowance for the tanks internal shape. The user can tell when the unit is in 'Volume Mode' as the blue LED flashes twice rapidly every 2.5 seconds when a volume message has been sent. The accuracy of the tank level value is +/- 1 % in case of linear volume table. Extreme tank shapes can cause bigger differences because of multiplying of the offset error of the sensor.

The Volume Mode PGN message is exactly the same as the Level Mode PGN message which means that the volume can easily be shown on any NMEA2000 display that accepts Fluid Level PGNs from tank senders. The Volume Mode Tank data can be entered from any Offshore Systems Display that is equipped to set up this data. Please contact us for more information on these displays. It can also be set up at manufacture if the information is made available at the time of ordering.

LEVEL MODE can be set with the Tank Type Switch SW1 by setting the switch to 'C' and then placing a small magnet on the 'Magnet Calibration' position for 5 seconds. The blue LED flashing 2 times in a second to confirm that the magnet is in the proper position. The magnet can be remove after 5 seconds and the blue LED will Light up for 2 seconds to indicate that the unit registered the settings. Then return the switch to it's original position and the sender will transmit level messages as indicated by the blue LED flashing ONCE briefly every 2.5 seconds.

VOLUME MODE can be set with the Tank Type Switch SW1 by setting the switch to 'D', then placing the magnet on the 'Magnet Calibration' position for 5 seconds. The blue LED flashing 2 times in a second to confirm that the magnet is in the proper position. The magnet can be remove after 5 seconds and the blue LED will Light up for 2 seconds to indicate that the unit registered the settings. When the switch is returned to it's original positions the sender will transmit Volume messages as indicated by the blue LED flashing rapidly TWICE every 2.5 seconds.

4 MAINTENANCE

- Clean the unit with a soft cloth.
- Do not use chemical cleaners as they may remove paint or markings or may corrode the enclosure or seals.
- Ensure that the unit is mounted securely and cannot be moved relative to the mounting surface. If the unit is loose, tighten the mounting screws.
- Check the security of the cables connected to the NMEA 2000® connector, tighten if necessary.
- Check the security of the Crimp receptacle to the 4291 Spade Terminals

5 TECHNICAL SPECIFICATION

As Offshore Systems are constantly improving their products specifications are subject to change without notice. Offshore System's products are designed to be accurate and reliable however they should only be used as aids to navigation and not as a replacement for traditional navigation aids and techniques.

Specification	
Parameter	**Comment**
Accuracy	±1% (Level Mode)
Number of Tanks	Up to 16 per tank type on single network

Certifications	
Parameter	**Comment**
NMEA2000	Level B

NMEA2000® Parameter Group Numbers (PGNs)		
Type	**PGN No**	**PGN Name**
Monitor	PGN127505	Fluid Level
Protocol	PGN126464	Tx/Rx PGN List
	PGN126996	Product Information
	PGN059392	ISO Acknowledge
	PGN059904	ISO Request
	PGN060928	ISO Address Claim
	PGN126208	Command/Request Group

Electrical and Mechanical		
Parameter	**Value**	**Comment**
Battery Operating Voltage	12 to 24 Volts	
CAN Operating Voltage	9 to 32 Volts	
Power Consumption	71.5mA	Average Operating
Load Equivalence Number	2	LEN
Reverse Battery Protection	Yes	Indefinately
Load Dump Protection	Yes	SAE J1113
Size	mm	98 x 58 x 17
Weight	gr	135

Environmental	
Parameter	**Value**
IEC 60954 Classification	Protected
Degree of Protection	IP66
Operating Temperature	-25°C to 50°C
Storage Temperature	-40°C to 70°C
Relative Humidity	93%RH @40° per IEC60945-8.2

6 TECHNICAL SUPPORT

If you require technical support for any Offshore Systems products you can reach us using any of the following ways:

- Tel: +44(0)1425 610022
- Fax: +44(0)1425 614794
- Email: support@osukl.com
- Web: www.osukl.com
- Post: Offshore Systems UK Ltd
  Unit 10-11 Milton Business Centre
  Wick Drive, New Milton, Hampshire BH25 6RH, UK.

Offshore Systems (UK) Ltd
Unit 10 -11 Milton Business Centre, Wick Drive,
New Milton, Hampshire, BH25 6RH, United Kingdom

Tel: +44(0)1425 610022 Fax: +44(0)1425 614794
Email: mail@osukl.com Web: www.osukl.com

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7 WARRANTY

Offshore Systems warrants this product to be free from defects in materials and workmanship for one year from the date of original purchase. If within the applicable period any such products shall be proved to Offshore Systems satisfaction to fail to meet the
above limited warranty, such products shall be repaired or replaced at Offshore Systems option. Purchaser's exclusive remedy and Offshore Systems sole obligation hereunder, provided product is returned pursuant to the return requirements below, shall be limited to the repair or replacement, at Offshore Systems option, of any product not meeting the above limited warranty and which is returned to Offshore Systems; or if Offshore Systems is unable to deliver a replacement that is free from defects in materials or workmanship, Purchaser's payment for such product will be refunded. Offshore Systems assumes no liability whatsoever for expenses of removing any defective product or part, or for installing the repaired product or part or a replacement therefore or for any loss or damage to equipment in connection with which Offshore Systems products or parts shall be used. The foregoing warranties shall not apply with respect to products subjected to negligence, misuse, misapplication, accident, damages by circumstances beyond Offshore Systems control, to improper installation, operation, maintenance, or storage, or to other than normal use or service.
THE FOREGOING WARRANTIES ARE EXPRESSLY IN LIEU OF AND EXCLUDES ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE.
Statements made by any person, including representatives of Offshore Systems, which are inconsistent or in conflict with the terms of this Limited Warranty, shall not be binding upon Offshore Systems unless reduced to writing and approved by an officer of Offshore Systems.
IN NO CASE WILL OFFSHORE SYSTEMS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, DAMAGES FOR LOSS OF USE, LOSS OF ANTICIPATED PROFITS OR SAVINGS, OR ANY OTHER LOSS INCURRED BECAUSE OF INTERRUPTION OF SERVICE. IN NO EVENT SHALL OFFSHORE SYSTEMS AGGREGATE LIABILITY EXCEED THE PURCHASE PRICE OF THE PRODUCT(S) INVOLVED. OFFSHORE SYSTEMS SHALL NOT BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES, WHETHER ARISING OUT OF BREACH OF CONTRACT OR WARRANTY, TORT (INCLUDING NEGLIGENCE), OR OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY OFFSHORE SYSTEMS, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO.
Offshore Systems does not warrant that the functions contained in any software programs or products will meet purchaser's requirements or that the operation of the software programs or products will be uninterrupted or error free. Purchaser assumes responsibility for the selection of the software programs or products to achieve the intended results, and for the installation, use and results obtained from said programs or products. No specifications, samples, descriptions, or illustrations provided by Offshore Systems to Purchaser, whether directly, in trade literature, brochures or other documentation shall be construed as warranties of any kind, and any failure to conform to such specifications, samples, descriptions, or illustrations shall not constitute any breach of Offshore Systems limited warranty.

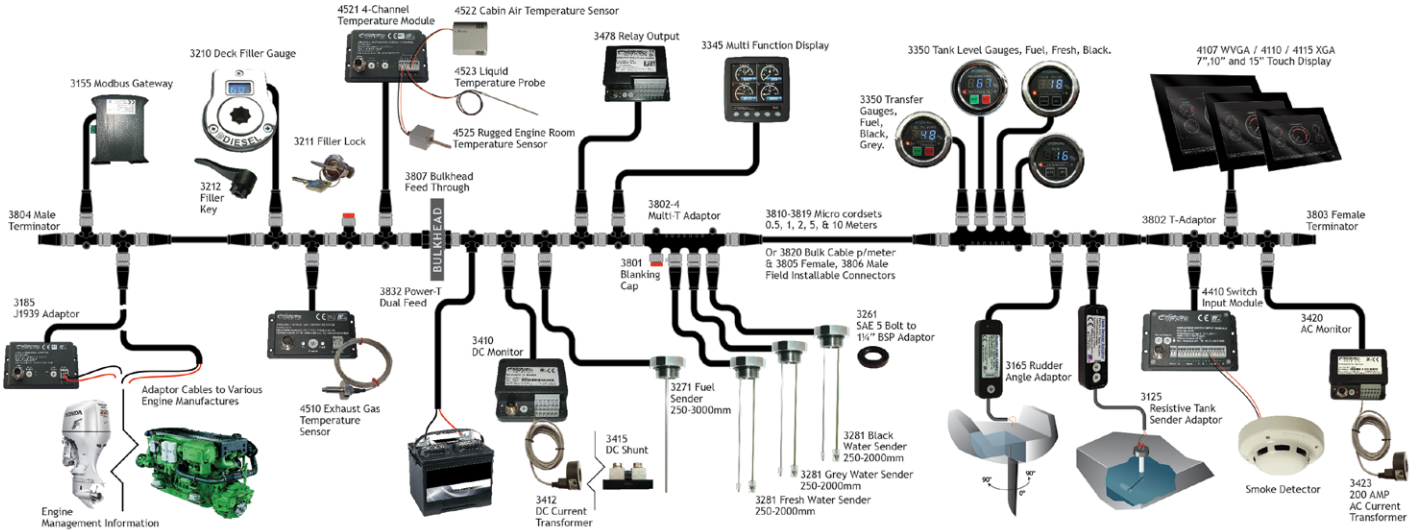
Warranty Return Procedure

To apply for warranty claims, contact Offshore Systems or one of its dealers to describe the problem and determine the appropriate course of action. If a return is necessary, place the product in its original packaging together with proof of purchase and send to an Authorized Offshore Systems Service Location. You are responsible for all shipping and insurance charges. Offshore Systems will return the replaced or repaired product with all shipping and handling prepaid except for requests requiring expedited shipping (i.e. overnight shipments). Failure to follow this warranty return procedure could result in the product's warranty becoming null and void.

Offshore Systems reserves the right to modify or replace, at its sole discretion, without prior notification, the warranty listed above.

OFFSHORE SYSTEMS PRODUCT MAP

NMEA2000® VESSEL MONITORING AND CONTROL SYSTEMS


4521 4-Channel Temperature Module
4522 Cabin Air Temperature Sensor
3210 Deck Filler Gauge
3478 Relay Output
3345 Multi Function Display
3350 Tank Level Gauges, Fuel, Fresh, Black.
4107 WVGA / 4110 / 4115 XGA 7",10" and 15" Touch Display
3155 Modbus Gateway
4523 Liquid Temperature Probe
3350 Transfer Gauges, Fuel, Black, Grey.
3211 Filler Lock
4525 Rugged Engine Room Temperature Sensor
3212 Filler Key
3807 Bulkhead Feed Through
3804 Male Terminator
3802-4 Multi-T Adaptor
3810-3819 Micro cordsets 0.5, 1, 2, 5, & 10 Meters
3802 T-Adaptor
3803 Female Terminator
Or 3820 Bulk Cable p/meter & 3805 Female, 3806 Male Field Installable Connectors
3801 Blanking Cap
3185 J1939 Adaptor
3832 Power-T Dual Feed
4410 Switch Input Module
3420 AC Monitor
3261 SAE 5 Bolt to 1¼" BSP Adaptor
3410 DC Monitor
3165 Rudder Angle Adaptor
3125 Resistive Tank Sender Adaptor
Adaptor Cables to Various Engine Manufactures
4510 Exhaust Gas Temperature Sensor
3271 Fuel Sender 250-3000mm
3281 Black Water Sender 250-2000mm
3281 Grey Water Sender 250-2000mm
3281 Fresh Water Sender 250-2000mm
3415 DC Shunt
3412 DC Current Transformer
Smoke Detector
3423 200 AMP AC Current Transformer
Engine Management Information

Up to 16 each type of Sender can be installed on a single network